

Pathogens and Pollutants Expected to Be Present in Sewer Overflows.

Parasites protozoa

Pathogen	Symptoms, Illnesses Caused
<i>Cryptosporidium parvum</i>	Gastroenteritis: diarrhea, loose or watery stools, stomach cramps, upset stomach, and a slight fever; children and pregnant women are more susceptible to dehydration as a result of <i>Cryptosporidium</i> ; can lead to life-threatening disease in those with weakened immune systems; there is no effective treatment.
<i>Cyclospora cayentanensis</i>	Cyclosporiasis: watery diarrhea, with frequent, sometimes explosive, bowel movements, loss of appetite, substantial loss of weight, bloating, increased gas, stomach cramps, nausea, vomiting, muscle aches, low grade fever, and fatigue; not considered contagious; antibiotic treatment available; lasts a few days to a month; relapses possible.
<i>Entamoeba histolytica</i>	Amebiasis: loose stools, stomach pain, and stomach cramping; Amoebic dysentery is a more serious form of Amebiasis; very rarely invades the liver and causes an abscess, even more rarely invades other body parts such as the lungs or brain; difficult to diagnose; antibiotic treatment is available; contagious.
<i>Giardia lamblia</i>	Diarrhea, loose or watery stool, stomach cramps, and upset stomach; may lead to weight loss and dehydration; children and pregnant women more susceptible to dehydration; very contagious; lasts 2-3 weeks in otherwise healthy persons; prescription drugs are available.
<i>Naegleria fowleri</i>	<i>Naegleria</i> infection [also called primary amebic meningoencephalitis (PAM)]: headache, fever, nausea and vomiting, stiff neck, confusion, lack of attention to people and surroundings, loss of balance and bodily control, seizures, and hallucinations are signs and symptoms of infection; infection is very rare; without immediate treatment, death occurs within 10 days; not contagious.
<i>Balantidium coli</i>	Dysentery, intestinal ulcers, abdominal pain, weight loss; most cases asymptomatic; treatment is available.
<i>Isospora belli</i> and <i>Isospora hominus</i>	Intestinal parasites, gastrointestinal infection.

<i>Toxoplasma gondii</i>	Toxoplasmosis: rare among those with healthy immune systems; flu-like symptoms; those with weakened immune systems can become very ill, resulting in damage to the eye or brain; infants infected in the womb can be born with mental retardation or other serious complication; treatment is rarely needed in healthy persons; drugs are available.
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Bacteria

Pathogen	Symptoms, Illnesses Caused
<i>Campylobacter</i>	Gastroenteritis, Campylobacteriosis: diarrhea, cramping, abdominal pain, fever, diarrhea may be bloody and can be accompanied by nausea and vomiting; most recover within 2 to 10 days; some may develop arthritis; one in every 1,000 reported campylobacteriosis cases leads to Guillain-Barre syndrome (a rare disease that affects the nerves).
<i>Enterococcus spp.</i>	Urinary tract infections, bacteremia, subacute endocarditis; wound infections and intrabdominal abscesses are generally polymicrobial; meningitis.
<i>E. coli</i> 0157:H7	Gastroenteritis: severe bloody diarrhea or nonbloody diarrhea, abdominal cramps; most with only diarrhetic symptoms fully recover; 2% to 7% of children and elderly infected with <i>E. coli</i> , may develop hemolytic uremic syndrome, in which the red blood cells are destroyed and the kidneys fail; 33% of persons with hemolytic uremic syndrome have abnormal kidney function many years later, and a few require long-term dialysis, a smaller percentage of persons with hemolytic uremic syndrome develop high blood pressure, seizures, blindness, paralysis, and the effects of having part of their bowel removed.
<i>Vibrio cholerae</i>	Cholera: infection of the intestine, acute diarrhea; one in 20 infected persons has severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps leading to dehydration and shock.
<i>Leptospira</i>	Leptospirosis: high fever, severe headache, chills, muscle aches, and vomiting, and may include jaundice (yellow skin and eyes), red eyes, abdominal pain, diarrhea, or a rash; if the disease is not treated, the patient could develop kidney damage, meningitis (inflammation of the membrane around the brain and spinal cord), liver failure, and respiratory distress; in rare cases death occurs.

<i>Pseudomonas dermatitis / Folliculitis</i>	Dermatitis.
<i>Pseudomonas aeruginosa</i>	Swimmer's Ear.
<i>Salmonella</i>	Salmonellosis: fever, abdominal cramps, and diarrhea (sometimes bloody); most with diarrhetic symptoms completely recover; a small number of persons will develop Reiter's syndrome leading to pains in their joints, irritation of the eyes, and painful urination; Reiter's syndrome can last for months or years, and can lead to chronic arthritis.
<i>Salmonella Typhi</i>	Typhoid fever: fever, weakness, or stomach pains, headache, or loss of appetite; rash of flat, rose-colored spots; vaccines are available.
<i>Shigella</i>	Bacterial dysentery, Shigellosis: diarrhea (often bloody), fever, and stomach cramps.
<i>Pathogen</i>	Symptoms, Illnesses Caused
<i>Yersinia</i>	Yersiniosis: symptoms in children are fever, abdominal pain, and diarrhea, which is often bloody; in adults, right-sided abdominal pain appendicitis.

Viruses

Pathogen	Symptoms, Illnesses Caused
Hepatitis A	Jaundice, fatigue, abdominal pain, loss of appetite, nausea, diarrhea, fever; there is no long-term infection; 15% of those infected may have prolonged symptoms lasting up to nine months; those who have had the disease once may never become infected again; vaccines are available.
Hepatitis B	Jaundice, fatigue, abdominal pain, loss of appetite, nausea, vomiting, joint pain, cirrhosis and liver cancer (lead to 4000-5000 deaths in the U.S. each year); chronic infection occurs in 90% of infants infected at birth, 30% of children infected prior to age 5, and 6% of persons infected after age 5; vaccines are available.
Adenoviruses	Viral gastroenteritis, vomiting, diarrhea.
Rotavirus	Viral gastroenteritis, vomiting, diarrhea.

Enteroviruses, such as coxsackieviruses and echoviruses	Viral (aseptic) meningitis: fever, severe headache, stiff neck, bright lights hurt the eyes, drowsiness or confusion, and nausea, and vomiting.
Calicivirus	Viral gastroenteritis: vomiting, diarrhea; infants, young children, and persons who are unable to care for themselves, such as the disabled or elderly, are at risk for dehydration from loss of fluid; immunocompromised persons are at risk for dehydration because they may get a more serious illness, with greater vomiting or diarrhea.
Astrovirus	Viral gastroenteritis: vomiting, diarrhea; infants, young children, and persons who are unable to care for themselves, such as the disabled or elderly, are at risk for dehydration from loss of fluid; immunocompromised persons are at risk for dehydration because they may get a more serious illness, with greater vomiting or diarrhea.
Norwalk virus and Norwalk-like viruses	Viral gastroenteritis: vomiting, diarrhea; infants, young children, and persons who are unable to care for themselves, such as the disabled or elderly, are at risk for dehydration from loss of fluid; immunocompromised persons are at risk for dehydration because they may get a more serious illness, with greater vomiting or diarrhea.
Poliovirus	Poliomyelitis: sore throat, fever, nausea, vomiting, abdominal pain, constipation, flu-like symptoms, stiffness in the neck, back, and legs.

Helminths

Pathogen	Symptoms, Illnesses Caused
<i>Ascaris</i> (intestinal roundworm)	Ascariasis: most people have no symptoms; abdominal pain, difficulty breathing, and blocked intestines.
<i>Ancylostoma</i> (hookworm)	Hookworm infections: rash; light infection may cause no symptoms; heavy infection can cause anemia, abdominal pain, diarrhea, loss of appetite, and weight loss; heavy, chronic infections can stunt growth and mental development.

<i>Schistosoma</i>	Cercarial dermatitis -(Swimmer's Itch): rash or itchy skin; fever, chills, cough, and muscle aches can begin within 1-2 months of infection; rarely, eggs are found in the brain or spinal cord and can cause seizures, paralysis, or spinal cord inflammation; for people who are repeatedly infected for many years, the parasite can damage the liver, intestines, lungs, and bladder.
<i>Trichuris trichiura</i> (human whipworm)	Most frequently asymptomatic; heavy infections, especially in small children, can cause gastrointestinal problems (abdominal pain, diarrhea, rectal prolapse) and possibly growth retardation.

Metals and other pollutants

Pollutant	Possible Health Effects
Lead	Nerve degeneration, including hearing loss, peripheral neuropathy (causing tingling or muscle weakness in fingers, wrists, or ankles), and brain damage; kidney damage; increased blood pressure; blood anemia; lowered immune system function; reduced sperm count and motility; miscarriage, stillbirth, premature birth, and reduced birth weight; colic and impaired mental and physical development (in children).
Mercury	Permanent brain damage, personality changes (irritability, shyness, nervousness), tremors, changes in vision (constriction of the visual field), deafness, muscle incoordination, loss of sensation, and difficulties with memory.
Copper	Dizziness, headaches, diarrhea, and liver and kidney damage.
Zinc	Stomach cramps, nausea, vomiting, anemia, pancreas damage, and reduced blood levels of high density lipoprotein cholesterol (the good form of cholesterol).
PCBs	Acne-like skin conditions (chloracne) and rashes, liver damage (PCB exposures in the general population are not likely to result in skin and liver effects), anemia; liver, stomach, and thyroid gland injuries; changes in the immune system; behavioral alterations; and impaired reproduction.
Pesticides	Liver and kidney damage, elevated risk of cancer.

